NCRST-SEPP Implementation of MCDM results of I-269 case study

by:

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Content

1. MCDM Purpose and needs for NCRST-SEPP

2. Dealing with different scales: Multi-Scale Approach

3. Automating the process:
   - Results of Initial Corridor – overall I-269
   - Refined results using Desoto County data
**Purpose**

Evaluating transportation corridor alignments is a complex, lengthy process that can involve many decision makers and stakeholders.

Decision always delays due to conflicting interests and different opinions.

**Needs**

Gathering input about sensitive issues and values is vital to the process of alignment selection (and can be iterative).

MCDM offers a framework to deal with differing opinions in a structured process that can be fully integrated into a spatial decision support system.

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Haas & Meixner (2006)  [http://www.boku.ac.at/mi/](http://www.boku.ac.at/mi/)
Multi-Scale MCDM Approach

Small Scale
- General Corridor Definition: Federal and Widely Available Data.

Medium Scale
- Refine Corridor and Generate Initial Feasible Alternatives.

Large Scale
MULTI-SCALE APPROACH

1) I-269 study bed
MULTI-SCALE APPROACH

1) I-269 study bed

2) Small scale: general cumulative cost surface from best available Federal data
MULTI-SCALE APPROACH

1) I-269 study bed

2) Small scale: general cumulative cost surface from best available Federal data

3) Defining initial corridor
1) I-269 study bed

2) **Small scale**: general cumulative cost surface from best available Federal data

3) Defining initial corridor

4) **Medium scale**: Identifying feasible alignments
MULTI-SCALE APPROACH

1) I-269 study bed

2) **Small scale**: general cumulative cost surface from best available Federal data

3) Defining initial corridor

4) **Medium scale**: Identifying feasible alignments

5) **Large scale**: Refining alternatives using local county data to arrive at preferred alternatives for impact assessment and refined ground survey
USING SPATIAL MCDM TO DEFINE INITIAL CORRIDORS TO BYPASS THE MEMPHIS METROPOLITAN AREA
Study area – Memphis Metropolitan

Background = Digital Raster Graphics
Developed Areas (criteria = avoidance)
Water bodies  (criteria = avoidance)

Developed Areas  
(NLCD)

Water Bodies  
(NHD + NLCD)
Wetlands (criteria = avoidance)

Developed Areas (NLCD)

Water Bodies (NHD + NLCD)

Wetlands (NWI+NLCD)
Forest (criteria = avoidance)

- Developed Areas (NLCD)
- Water Bodies (NHD + NLCD)
- Wetlands (NWI+NLCD)

**Forest** (NLCD)
Agriculture (criteria = avoidance)

Developed Areas (NLCD)

Water Bodies (NHD + NLCD)

Wetlands (NWI + NLCD)

Forest (NLCD)

Agriculture (NLCD)
Major Roads (criteria = reuse)

Developed Areas (NLCD)
Water Bodies (NHD + NLCD)
Wetlands (NWI+NLCD)
Forest (NLCD)
Agriculture (NLCD)
Major Roads (BTS)
Cumulative Cost Surface
Definition of Initial Corridor
Final I-269 and our Initial Corridor
REFINING RESULTS:

MOVING FROM REGIONAL TO LOCAL ANALYSIS
TO SELECT FEASIBLE CORRIDORS FOR EIS FILED WORK
Moving from regional to local analysis

**SELECTION OF INITIAL CORRIDOR**

Mostly Federal Data

**SELECTION OF FEASIBLE CORRIDORS FOR EIS FIELD WORK**

Mostly County and MPO Data
Developed areas & long term planning (Desoto County data)
Refined Wetlands - Forest Wetlands (MTRI) & Hydric Soils (SSURGO)
Distance from streams and waterbodies (NHD)
100y Floodplain (Desoto County data)
Slope
Cemeteries and Churches (Desoto County data)
Schools (Desoto County data) - “density of schools”
Existent buildings (Desoto County data) – “avoidance”
Existent roads (Desoto County data) – “reusability”
Putting together all data
Combining Inputs

**GEODATA**

**RANKING**

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**SCENARIO**

Cumulative cost surface computed from local data

Definition of local corridor and Least-cost path
NCRST-SEPP Implementation of MCDM results of I-269 case study

Alternatives considered for EIS ground work

Alignment B-1

Alignment B-2

Cumulative Cost Corridor

Final Alignment
GENERATING COMPARATIVE SCENARIOS:
Scenario 1: Avoidance
Emphasize avoiding developed and environmentally sensitive areas

Scenario 2: Reuse
Emphasize reuse of existing roads
Scenario 1: Avoidance
Emphasize avoiding developed and environmentally sensitive areas

Scenario 2: Reuse
Emphasize reuse of existing roads
Scenario 1: Avoidance  
Emphasize avoiding developed and environmentally sensitive areas

Automatic Least-Cost Path closely approximates the final planned alignment of I-269!

Scenario 2: Reuse  
Emphasize reuse of existing roads

Automatic Least-Cost Path follows the Existing roads
Scenario 1: Avoidance
Emphasize avoiding developed and environmentally sensitive areas

Scenario 2: Reuse
Emphasize reuse of existing roads
Scenario 1
Conclusion

• This demonstration shows that AHP-Based MCDM can be effectively used to arrive at generalized corridors using highly available data.

• The scenarios generated show that MCDM is capable of delivering results that almost exactly correspond to human practices used to arrive at a final alternative selection per the I-69/269 FEIS.
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Streamlining Environmental and Planning Processes

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